

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 02 November 2000 (02.11.00)	
International application No. PCT/GB00/00277	Applicant's or agent's file reference P22866A/VSL/CLF/PPP
International filing date (day/month/year) 01 February 2000 (01.02.00)	Priority date (day/month/year) 01 February 1999 (01.02.99)
Applicant LIGHTOWLER, Neil	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

31 August 2000 (31.08.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Juan Cruz Telephone No.: (41-22) 338.83.38
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/00277

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06N3/063

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 557 997 A (HITACHI LTD) 1 September 1993 (1993-09-01)	1,2,5,7, 10-14, 17,19
Y	column 5, line 13 -column 16, line 38; figures 1-22	3,4,6,8, 18,20,21
Y	EP 0 718 757 A (MOTOROLA INC) 26 June 1996 (1996-06-26) abstract column 1, line 49 -column 2, line 18 ----- -/--	3,4,6

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

26 June 2000

Date of mailing of the international search report

30/06/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Schenkels, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/00277

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	BOTROS N M ET AL: "HARDWARE IMPLEMENTATION OF AN ARTIFICIAL NEURAL NETWORK USING FIELDPROGRAMMABLE GATE ARRAYS (FPGA'S)" IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS,US,IEEE INC. NEW YORK, vol. 41, no. 6, 1 December 1994 (1994-12-01), pages 665-667, XP000506435 ISSN: 0278-0046 abstract	8,18
Y	EP 0 694 852 A (PAILLET GUY ;IBM (US)) 31 January 1996 (1996-01-31) page 6, line 50 - line 59 page 11, line 20 - line 43	20,21
A	YASUNAGA M ET AL: "A SELF-LEARNING DIGITAL NEURAL NETWORK USING WAFER-SCALE LSI" IEEE JOURNAL OF SOLID-STATE CIRCUITS,US,IEEE INC. NEW YORK, vol. 28, no. 2, 1 February 1993 (1993-02-01), pages 106-113, XP000338332 ISSN: 0018-9200 page 108, left-hand column, line 23 -page 113, left-hand column, line 28; figures 3-10	1,20

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00277

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0557997	A	01-09-1993	JP	5242065 A	21-09-1993
EP 0718757	A	26-06-1996	US	5598362 A	28-01-1997
			JP	8234962 A	13-09-1996
EP 0694852	A	31-01-1996	CA	2149478 A	29-01-1996
			JP	8069445 A	12-03-1996
			KR	164943 B	15-01-1999
			US	5621863 A	15-04-1997

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

Murgitroyd & Company
373 Scotland Street
Glasgow G5 8QA
UNITED KINGDOM

MURGITROYD & COMPANY

03 JUL 2000

COMP

**NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION**

(PCT Rule 44.1)

Date of mailing
(day/month/year)

30/06/2000

Applicant's or agent's file reference

P22866A/VSL/CLF/PPP

FOR FURTHER ACTION

See paragraphs 1 and 4 below

International application No.

PCT/GB 00/00277

International filing date

(day/month/year)

01/02/2000

Applicant

AXEON LIMITED et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 48):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lucia Van Pinxteren

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?**Letter (Section 205(b)):**

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)".

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P22866A/VSL/CLF/PPP	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 00277	International filing date (day/month/year) 01/02/2000	(Earliest) Priority Date (day/month/year) 01/02/1999

Applicant

AXEON LIMITED et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2.



Certain claims were found unsearchable (See Box I).

3.



Unity of invention is lacking (see Box II).

4. With regard to the title,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the abstract,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention

11

None of the figures.

IN NATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00277

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06N3/063

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 557 997 A (HITACHI LTD) 1 September 1993 (1993-09-01)	1,2,5,7, 10-14, 17,19
Y	column 5, line 13 -column 16, line 38; figures 1-22	3,4,6,8, 18,20,21
Y	EP 0 718 757 A (MOTOROLA INC) 26 June 1996 (1996-06-26) abstract column 1, line 49 -column 2, line 18 -/-	3,4,6

☒ Further documents are listed in the continuation of box C☒ Patent family members are listed in annex

* Special categories of cited documents

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

26 June 2000

Date of mailing of the international search report

30/06/2000

Name and mailing address of the ISA

European Patent Office, P B 5818 Patensaan 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Schenke's, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/00277

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	BOTROS N M ET AL: "HARDWARE IMPLEMENTATION OF AN ARTIFICIAL NEURAL NETWORK USING FIELDPROGRAMMABLE GATE ARRAYS (FPGA'S)" IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS,US,IEEE INC. NEW YORK, vol. 41, no. 6, 1 December 1994 (1994-12-01), pages 665-667, XP000506435 ISSN: 0278-0046 abstract	8,18
Y	EP 0 694 852 A (PAILLET GUY ;IBM (US)) 31 January 1996 (1996-01-31) page 6, line 50 - line 59 page 11, line 20 - line 43	20,21
A	YASUNAGA M ET AL: "A SELF-LEARNING DIGITAL NEURAL NETWORK USING WAFER-SCALE LSI" IEEE JOURNAL OF SOLID-STATE CIRCUITS,US,IEEE INC. NEW YORK, vol. 28, no. 2, 1 February 1993 (1993-02-01), pages 106-113, XP000338332 ISSN: 0018-9200 page 108, left-hand column, line 23 -page 113, left-hand column, line 28; figures 3-10	1,20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/00277

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0557997 A	01-09-1993	JP 5242065 A	21-09-1993
EP 0718757 A	26-06-1996	US 5598362 A	28-01-1997
		JP 8234962 A	13-09-1996
EP 0694852 A	31-01-1996	CA 2149478 A	29-01-1996
		JP 8069445 A	12-03-1996
		KR 164943 B	15-01-1999
		US 5621863 A	15-04-1997

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

Murgitroyd & Company
373 Scotland Street
Glasgow G5 8QA
GRANDE BRETAGNE

MURGITROYD
& COMPANY

13 APR 2001

COMP

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

09.04.2001

Applicant's or agent's file reference
P22866A/VSL/CLF/PPP

IMPORTANT NOTIFICATION

International application No
PCT/GB00/00277

International filing date (day/month/year)
01/02/2000

Priority date (day/month/year)
01/02/1999

Applicant

AXEON LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Benigar, M

Tel +49 89 2399-2996





Form PCT/IPEA/418 (July 1992)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P22866A/VSL/CLF/PPP		FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB00/00277	International filing date (day/month/year) 01/02/2000	Priority date (day/month/year) 01/02/1999	
International Patent Classification (IPC) or national classification and IPC G06N3/063			
Applicant AXEON LIMITED et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 10 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 31/08/2000		Date of completion of this report 09.04.2001	
Name and mailing address of the international preliminary examining authority  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Borotschnig, H Telephone No. +49 89 2399 7459 	

Form PCT/IPEA/409 (cover sheet) (January 1994)

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00277

I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

Description, pages:

1-186 as originally filed

Claims, No.:

1-23 as originally filed

Drawings, sheets:

1/16-16/16 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**International application No. **PCT/GB00/00277**☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Yes:	Claims 7-19
	No:	Claims 1-6,20-23
Inventive step (IS)	Yes:	Claims
	No:	Claims 7-19
Industrial applicability (IA)	Yes:	Claims 1-23
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/00277

Re Item V**Reasoned statement under Art. 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Reference is made to the following documents:**

D1: LIGHTOWLER ET AL: 'A MODULAR APPROACH TO IMPLEMENTATION OF THE SELF-ORGANISING MAP', Proc. of WSOM 97, Workshop on Self-Organizing Maps, Espoo, Finland, June 4-6 1997, Helsinki University of Technology, Neural Networks Research Centre, pp. 130-135

(no page numbering in the present copy)

D2: LIGHTOWLER ET AL: 'AN INTRODUCTION TO MODULAR MAP SYSTEMS', IEE Colloquium on Neural and Fuzzy Systems, 9 May 1997, INSPEC 5615702, pp. 3/1-3/4

D3: RÜPING ET AL: 'A SCALABLE PROCESSOR ARRAY FOR SELF-ORGANIZING FEATURE MAPS', Proc. 5th Int. Conf. on Microelectronics for Neural Networks, 12-14 Feb 1996, pp 285-291

D4: RÜPING ET AL: 'A HIGH PERFORMANCE SOFM HARDWARE-SYSTEM', Biological and Artificial Computation: From Neuroscience to Technology, Int. Work-Conf. on Artificial and Natural Neural Networks, IWANN 97, June 4- 6, 1997, Springer Lect. Notes on Comp. Science Vol. 1240, pp. 772-781

D5: EP-A-0 694 852 (PAILLET GUY;IBM (US)) 31 January 1996 (1996-01-31)

D6: EP-A-0 718 757 (MOTOROLA INC) 26 June 1996 (1996-06-26)

Documents D1-D4 were not cited in the international search report. The work of Rüping (D3+D4) is shortly discussed in the application (cf. the comments made under Item VII) which also points to publications D1-D2 that were co-authored by the inventor. D1 and D2 appear to pre-disclose most of the general ideas underlying the approach presented in the application. Documents D3 and D4 disclose an alternative system in somewhat more detail. D5 discloses a hardware solution for a modular neural network architecture focusing on Radial Basis Function type networks built up from modules of neurons, each of which calculates the Manhattan distance to an input vector. D6 discloses the use of the same instruction set for different bit size operations in a Digital Signal Processor.

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2. As to present **claim 1**, documents D3 and D4 disclose a neuron (cf. section "Internal Hardware Structure") comprising all features of the claim (NB: apart from the features immediately apparent in D4, Fig. 1, the Figure must also be assumed to imply the presence of some sort of multiplexing means since one data-bus is used to provide data for 3 units: the weight memory, the alpha element and the calculation unit). Hence present claim 1 lacks novelty over D3-D4.

3. The subject matter of claim 1 also lacks novelty over the following documents:

D1 and D2 disclose a neural processing element (neuron) for use in a neural network, the processing element comprising (cf. D1 and D2, abstracts): arithmetic logic means (cf. D1 pg. 2 last but one parag., D2 pg. 3/2 3rd parag., "individual RISC processors"), an arithmetic shifter mechanism (ibid.), memory means (ibid., implied by the presence of "weight vectors" or "reference vector" of the neurons), data input means including at least one input port (ibid. implied by the use of "input vectors"), data output means including at least one output port (ibid. implied by the external use of information provided by the neurons: which one is active etc.). Even though "multiplexing means" are not explicitly mentioned in D1 or D2 they must again be considered to be disclosed implicitly as it is clear that each neuron will only have a limited number of pins and it is necessary to use the same bus to transport different data to different units which in turn implies some sort of multiplexing means. In any case, the addition of multiplexing means could not be considered to involve an inventive step.

D5 also discloses all features of claim 1 (cf. D5, abstract, Fig. 5 depicting a neuron and Figs. 7 and 8 depicting the details of the IF circuit (350) and the Dmin Determination Circuit (500) in Fig. 5).

4. As to present **claim 2**, all documents D1-D5 disclose how to employ the "neural processing element" as a single neuron in the neural network, (cf. eg. the abstracts.). Present claim 2 thus lacks novelty over D1-D5.
5. As to present **claim 3**, it must be assumed that the disclosure of D3-D4 implicitly includes the presence of "data bit size indicator means" since data of different bit sizes is transported via the data-bus (cf. D3 Fig. 1 and D4. Fig. 4, e.g. the alpha

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register stores 3 bits while the weights have 8 bits, cf. also D3, paragraph below Fig. 1). That fact implies that the multiplexing mechanism - by guiding the data transport via control bits - implicitly also indicates the "data bit size" through these control bits. Hence the subject matter of present claim 3 lacks novelty over D3-D4.

6. As to present **claim 4**, the added feature of enabling the execution of operations on different bit-size data values using the same instruction set is also known from D3-D4: cf. again D3 Figs. 1 and D4 Figs. 4 which disclose the use of data of different bit-sizes (8 bits for weights, 3 bits for the alpha value, 14 bits for the distances) which are finally all operated upon by the calculation unit "using the same instruction set" (i.e. the single instruction set disclosed).
7. As to present **claims 5 and 6**, register means which operate on different bit sizes are disclosed in D3, Fig. 2 (14 Bit Adder sums 14 bit S_in value and 8 bit x-w value) and the claimed subject matter appears to lack novelty over D3.
8. It appears that the subject matter of present **claims 7-19**, does not introduce any features which would require the exercise of inventive skills for a skilled person knowing the publications of Lightowler (documents D1 and D2).

For example, regarding claim 7, these documents disclose a neural network controller for controlling the operation of at least one processing element as claimed in any one of claims 1 to 6 (cf. D1, pg. 2, last but one paragraph "each module contains a controller"), the controller comprising: control logic means (implicit *ibid.*), data input means including at least one input port (*ibid.*), data output means including at least one output port (*ibid.*), data multiplexing means (cf. D1, pg. 4 second paragraph, "communicate via a bus" implies multiplexing means for larger data transfers from and to different sub-units), memory means (*ibid.*, "asynchronous communication" implies storage of data not yet ready to transfer), at least one handshake mechanism (*ibid.*). The additional use of an address map cannot be considered to involve an inventive step as it is a common design measure which the skilled person would employ according to circumstances.

Also the use of neural network modules comprising neural processing elements and at least one controller (claim 10) is evident over D1 and D2. The same is true

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for structuring the modules in neural networks (claim 12) and neural network devices (claim 17). The additional features of these claims and their dependant claims 8-9, 11, 13-16, 18-19 also appear to be normal design measures (cf. also D3-D5 which disclose e.g. programmable memory means, buffer memory means, synchronisation means, means to perform handshaking etc.). Such measures would be applied according to circumstances without the need for inventive skills.

Similarly it can be argued that the present formulation of claims 7-11 is broad enough to let the claimed subject matter be anticipated by the teachings of D3 and D4. In fact, the neural network controller of present claim 7 could also be an ordinary PC controlling external neurons like those disclosed in D3. D4 discloses in Figs. 2 and 3, section 3 ("The NB25-VME Board") a controller which controls 25 different modules each comprising at least one processing element. The controller communicates with a workstation and other elements via handshaking mechanisms (ibid. and D4, Fig. 1).

9. Method claim 20 only defines the training steps commonly applied for Self Organizing Maps (which is also explicitly confirmed by the statements made on pg. 64 of the description and Fig. 14 I). Consequently these training steps can be found in various documents. E.g. D1 and D2 already disclose all general aspects of the training phase: D1-D2 sect. "The Modular Map", cf. also D3 Fig. 6.
10. The additional features of claims 21-23 (Manhattan distance, square step function neighbourhood rotated by 45°) are known, cf. D1-D2 "The Modular Map".

Addendum:

11. In addition to the above statements concerning the claimed subject matter, it is noted that the lateral mode of expanding a network as described in appendix AA, pg. 34 differs from the one disclosed in D1 and D2. Nevertheless this new feature cannot be considered to be inventive over a combination of D1 (or D2) and D4. D4 teaches a very similar synchronised approach to detect the global winner which appears to be clearly more effective than the approach initially suggested in D1 and D2. The skilled person would thus improve the design of D1-D2 by relying on general knowledge and the hints given in D4.

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12. On the other hand, it must also be noted that the novelty objections raised against present claims 3-6 only result because it is currently possible to interpret the meaning of the claimed subject matter such that it is anticipated by the use of registers of different bit sizes in D3 and D4 while the ideas described at pp. 23-24, pg. 31 2nd parag., and appendix AA, pp. 48-53 of the application point in a different direction:

In particular, even though registers with different bit sizes are used in D3 and D4 these documents contain no hint that different bit sizes would be used for the weight values during different phases of neuronal activity in order to ensure convergence. In fact, D3 and D4 consider different bit sizes for different registers as only due to the facts that (a) the total distance between two neurons' reference vectors might not be representable by the 8 bits used for the single weights and that (b) the alpha value can be encoded by three bits.

However, the present application uses all available 12 bits for the components of the reference vector (4 of the 12 bit weight values encode digits behind the decimal point) when updating the reference vector but only the most significant 8 bits of each component (weight value) are used when calculating the distance between input vector and reference vector. In this latter case - since the accumulators are fixed at a size of 12 bits and since storing the sum of the distances between multiple bytes may well require all 12 bits - the 8 most significant bits of the stored weights (encoding the bits in front of the decimal point) must be shifted to the position of the least significant bits of the accumulator registers before adding them to the accumulator content (thereby truncating the weights for the purpose of determining the overall distance between reference vector and input vector). This utilizes the 12 bit hardware structure of the ALU in a cost-effective manner while simultaneously increasing the overall accuracy and convergence properties of the updating phase during which all 12 bits of the weights can be used. In addition, a switching mechanism controlled by a flag allows the same instruction set to be used for processing the weights utilizing different bit sizes during different phases of the neuron's activities.

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Furthermore, even though D6 discloses the details of a Digital Signal Processing chip using the same instruction set to process data of different bit sizes it cannot be argued that the skilled person would use such an approach for the weights of a single neuron of a neural network in order to ensure convergence. Quite on the contrary, without concrete experimental evidence in favour of such an approach (as presented on pg. 31 2nd paragraph of the present application) one would try to keep the design of a single neuron as simple as possible and would not introduce further complications by using only some parts of the weight values during certain processing phases but higher accuracy during other phases.

Re Item VII**Certain defects in the international application**

13. Appendix AA contains a complete patent description which is in large parts identical to the description given on pages 1-79. This duplication of information is unnecessary (Rule 9.1(iv)).
14. The statements made on pg. 79 and in Appendix AA, pg. 104 directed to a software emulation of the described circuits render the intended scope of protection unclear as such an embodiment has not been explicitly claimed. (Extending the scope of protection to a software emulation of the claimed circuits requires an appropriate claim).
15. Nearly all references to prior art are incomplete (citing only the name(s) of the author(s) or only the title of the article, cf. e.g. pg. 5 and appendix AA pp. 5-13).
16. The description contains contradictory statements concerning the use of an Euclidean metric and the Manhattan distance. In particular, using the Euclidean metric is envisaged, for example, at pg. 18 of appendix AA while it is strongly discouraged at pg. 26, lines 6-10 and pp. 45-46 of appendix AA. It is apparent from the description as a whole and from present claim 1 that the inventor intends to use only adder/subtractor units (which is only possible using the Manhattan distance and certain alpha values).

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All indications that the Euclidean distance might possibly be used instead of the Manhattan distance are causing inconsistencies because:

- (a) it is not at all apparent how the simplicity of a design containing no multipliers ("a feature of the invention", cf. pg. 4) could be maintained if the Euclidean distance was introduced,
- (b) and statements to the effect that this is not possible can already be found in the description, appendix AA, pp. 45-46,
- (c) and the description contains clear statements that in the considered implementation "Euclidean distance is replaced by Manhattan distance", *ibid.*

- 17. At page 20, lines 22-26 erroneous references are made to Figs. 11B, 11C and 3.
- 18. The expression "the controller comprises a handshake mechanism" in claim 7 is unclear as it appears to mix method and system features (the fact that "the controller comprises synchronising means to implement a handshake mechanism" is not clearly expressed). Similar comments apply to claim 16.
- 19. It appears that claim 13 is referencing the wrong claim (14 instead of 12).
- 20. The independent claims are neither cast in the two-part form recommended by Rule 6.3 (b), (i), (ii) PCT (having a pre-characterising portion which correctly reflects the prior art of document D1) nor are - alternatively - the features known from the prior art clearly identified in the description.
- 21. The requirements of Rule 5.1 (a) (ii) PCT are not met as documents D1 and D2 are not acknowledged and discussed in the opening part of the description.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P22866A/VSL/CLF/PPP	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 00277	International filing date (day/month/year) 01/02/2000	(Earliest) Priority Date (day/month/year) 01/02/1999
Applicant AXEON LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

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☐ None of the figures.

PATENT COOPERATION TREATY

PCT

REC'D 11 APR 2001

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P22866A/VSL/CLF/PPP	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/00277	International filing date (day/month/year) 01/02/2000	Priority date (day/month/year) 01/02/1999
International Patent Classification (IPC) or national classification and IPC G06N3/063		
Applicant AXEON LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 10 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 31/08/2000	Date of completion of this report 09.04.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Borotschnig, H Telephone No. +49 89 2399 7459



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International application No. PCT/GB00/00277

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-186 as originally filed

Claims, No.:

1-23 as originally filed

Drawings, sheets:

1/16-16/16 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

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International application No. PCT/GB00/00277

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	7-19
	No:	Claims	1-6,20-23
Inventive step (IS)	Yes:	Claims	
	No:	Claims	7-19
Industrial applicability (IA)	Yes:	Claims	1-23
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

R Item V

Reasoned statement under Art. 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1: LIGHTOWLER ET AL: 'A MODULAR APPROACH TO IMPLEMENTATION OF THE SELF-ORGANISING MAP', Proc. of WSOM 97, Workshop on Self-Organizing Maps, Espoo, Finland, June 4-6 1997, Helsinki University of Technology, Neural Networks Research Centre, pp. 130-135
(no page numbering in the present copy)

D2: LIGHTOWLER ET AL: 'AN INTRODUCTION TO MODULAR MAP SYSTEMS', IEE Colloquium on Neural and Fuzzy Systems, 9 May 1997, INSPEC 5615702, pp. 3/1-3/4

D3: RÜPING ET AL: 'A SCALABLE PROCESSOR ARRAY FOR SELF-ORGANIZING FEATURE MAPS', Proc. 5th Int. Conf. on Microelectronics for Neural Networks, 12-14 Feb 1996, pp 285-291

D4: RÜPING ET AL: 'A HIGH PERFORMANCE SOFM HARDWARE-SYSTEM', Biological and Artificial Computation: From Neuroscience to Technology, Int. Work-Conf. on Artificial and Natural Neural Networks, IWANN 97, June 4- 6, 1997, Springer Lect. Notes on Comp. Science Vol. 1240, pp. 772-781

D5: EP-A-0 694 852 (PAILLET GUY;IBM (US)) 31 January 1996 (1996-01-31)

D6: EP-A-0 718 757 (MOTOROLA INC) 26 June 1996 (1996-06-26)

Documents D1-D4 were not cited in the international search report. The work of Rüping (D3+D4) is shortly discussed in the application (cf. the comments made under Item VII) which also points to publications D1-D2 that were co-authored by the inventor. D1 and D2 appear to pre-disclose most of the general ideas underlying the approach presented in the application. Documents D3 and D4 disclose an alternative system in somewhat more detail. D5 discloses a hardware solution for a modular neural network architecture focusing on Radial Basis Function type networks built up from modules of neurons, each of which calculates the Manhattan distance to an input vector. D6 discloses the use of the same instruction set for different bit size operations in a Digital Signal Processor.

2. As to present **claim 1**, documents D3 and D4 disclose a neuron (cf. section "Internal Hardware Structure") comprising all features of the claim (NB: apart from the features immediately apparent in D4, Fig. 1, the Figure must also be assumed to imply the presence of some sort of multiplexing means since one data-bus is used to provide data for 3 units: the weight memory, the alpha element and the calculation unit). Hence present claim 1 lacks novelty over D3-D4.

3. The subject matter of claim 1 also lacks novelty over the following documents:

D1 and D2 disclose a neural processing element (neuron) for use in a neural network, the processing element comprising (cf. D1 and D2, abstracts): arithmetic logic means (cf. D1 pg. 2 last but one parag., D2 pg. 3/2 3rd parag., "individual RISC processors"), an arithmetic shifter mechanism (ibid.), memory means (ibid., implied by the presence of "weight vectors" or "reference vector" of the neurons), data input means including at least one input port (ibid. implied by the use of "input vectors"), data output means including at least one output port (ibid. implied by the external use of information provided by the neurons: which one is active etc.). Even though "multiplexing means" are not explicitly mentioned in D1 or D2 they must again be considered to be disclosed implicitly as it is clear that each neuron will only have a limited number of pins and it is necessary to use the same bus to transport different data to different units which in turn implies some sort of multiplexing means. In any case, the addition of multiplexing means could not be considered to involve an inventive step.

D5 also discloses all features of claim 1 (cf. D5, abstract, Fig. 5 depicting a neuron and Figs. 7 and 8 depicting the details of the IF circuit (350) and the Dmin Determination Circuit (500) in Fig. 5).

4. As to present **claim 2**, all documents D1-D5 disclose how to employ the "neural processing element" as a single neuron in the neural network, (cf. eg. the abstracts.). Present claim 2 thus lacks novelty over D1-D5.
5. As to present **claim 3**, it must be assumed that the disclosure of D3-D4 implicitly includes the presence of "data bit size indicator means" since data of different bit sizes is transported via the data-bus (cf. D3 Fig. 1 and D4. Fig. 4, e.g. the alpha

register stores 3 bits while the weights have 8 bits, cf. also D3, paragraph below Fig. 1). That fact implies that the multiplexing mechanism - by guiding the data transport via control bits - implicitly also indicates the "data bit size" through these control bits. Hence the subject matter of present claim 3 lacks novelty over D3-D4.

6. As to present **claim 4**, the added feature of enabling the execution of operations on different bit-size data values using the same instruction set is also known from D3-D4: cf. again D3 Figs. 1 and D4 Figs. 4 which disclose the use of data of different bit-sizes (8 bits for weights, 3 bits for the alpha value, 14 bits for the distances) which are finally all operated upon by the calculation unit "using the same instruction set" (i.e. the single instruction set disclosed).
7. As to present **claims 5 and 6**, register means which operate on different bit sizes are disclosed in D3, Fig. 2 (14 Bit Adder sums 14 bit S_in value and 8 bit x-w value) and the claimed subject matter appears to lack novelty over D3.
8. It appears that the subject matter of present **claims 7-19**, does not introduce any features which would require the exercise of inventive skills for a skilled person knowing the publications of Lightowler (documents D1 and D2).

For example, regarding claim 7, these documents disclose a neural network controller for controlling the operation of at least one processing element as claimed in any one of claims 1 to 6 (cf. D1, pg. 2, last but one paragraph "each module contains a controller"), the controller comprising: control logic means (implicit *ibid.*), data input means including at least one input port (*ibid.*), data output means including at least one output port (*ibid.*), data multiplexing means (cf. D1, pg. 4 second paragraph, "communicate via a bus" implies multiplexing means for larger data transfers from and to different sub-units), memory means (*ibid.*, "asynchronous communication" implies storage of data not yet ready to transfer), at least one handshake mechanism (*ibid.*). The additional use of an address map cannot be considered to involve an inventive step as it is a common design measure which the skilled person would employ according to circumstances.

Also the use of neural network modules comprising neural processing elements and at least one controller (claim 10) is evident over D1 and D2. The same is true

for structuring the modules in neural networks (claim 12) and neural network devices (claim 17). The additional features of these claims and their dependant claims 8-9, 11, 13-16, 18-19 also appear to be normal design measures (cf. also D3-D5 which disclose e.g. programmable memory means, buffer memory means, synchronisation means, means to perform handshaking etc.). Such measures would be applied according to circumstances without the need for inventive skills.

Similarly it can be argued that the present formulation of claims 7-11 is broad enough to let the claimed subject matter be anticipated by the teachings of D3 and D4. In fact, the neural network controller of present claim 7 could also be an ordinary PC controlling external neurons like those disclosed in D3. D4 discloses in Figs. 2 and 3, section 3 ("The NB25-VME Board") a controller which controls 25 different modules each comprising at least one processing element. The controller communicates with a workstation and other elements via handshaking mechanisms (ibid. and D4, Fig. 1).

9. Method **claim 20** only defines the training steps commonly applied for Self Organizing Maps (which is also explicitly confirmed by the statements made on pg. 64 of the description and Fig. 14 !). Consequently these training steps can be found in various documents. E.g. D1 and D2 already disclose all general aspects of the training phase: D1-D2 sect. "The Modular Map", cf. also D3 Fig. 6.
10. The additional features of **claims 21-23** (Manhattan distance, square step function neighbourhood rotated by 45°) are known, cf. D1-D2 "The Modular Map".

Addendum:

11. In addition to the above statements concerning the claimed subject matter, it is noted that the lateral mode of expanding a network as described in appendix AA, pg. 34 differs from the one disclosed in D1 and D2. Nevertheless this new feature cannot be considered to be inventive over a combination of D1(or D2) and D4. D4 teaches a very similar synchronised approach to detect the global winner which appears to be clearly more effective than the approach initially suggested in D1 and D2. The skilled person would thus improve the design of D1-D2 by relying on general knowledge and the hints given in D4.

12. On the other hand, it must also be noted that the novelty objections raised against present claims 3-6 only result because it is currently possible to interpret the meaning of the claimed subject matter such that it is anticipated by the use of registers of different bit sizes in D3 and D4 while the ideas described at pp. 23-24, pg. 31 2nd parag., and appendix AA, pp. 48-53 of the application point in a different direction:

In particular, even though registers with different bit sizes are used in D3 and D4 these documents contain no hint that different bit sizes would be used for the weight values during different phases of neuronal activity in order to ensure convergence. In fact, D3 and D4 consider different bit sizes for different registers as only due to the facts that (a) the total distance between two neurons' reference vectors might not be representable by the 8 bits used for the single weights and that (b) the alpha value can be encoded by three bits.

However, the present application uses all available 12 bits for the components of the reference vector (4 of the 12 bit weight values encode digits behind the decimal point) when updating the reference vector but only the most significant 8 bits of each component (weight value) are used when calculating the distance between input vector and reference vector. In this latter case - since the accumulators are fixed at a size of 12 bits and since storing the sum of the distances between multiple bytes may well require all 12 bits - the 8 most significant bits of the stored weights (encoding the bits in front of the decimal point) must be shifted to the position of the least significant bits of the accumulator registers before adding them to the accumulator content (thereby truncating the weights for the purpose of determining the overall distance between reference vector and input vector). This utilizes the 12 bit hardware structure of the ALU in a cost-effective manner while simultaneously increasing the overall accuracy and convergence properties of the updating phase during which all 12 bits of the weights can be used. In addition, a switching mechanism controlled by a flag allows the same instruction set to be used for processing the weights utilizing different bit sizes during different phases of the neuron's activities.

Furthermore, even though D6 discloses the details of a Digital Signal Processing chip using the same instruction set to process data of different bit sizes it cannot be argued that the skilled person would use such an approach for the weights of a single neuron of a neural network in order to ensure convergence. Quite on the contrary, without concrete experimental evidence in favour of such an approach (as presented on pg. 31 2nd paragraph of the present application) one would try to keep the design of a single neuron as simple as possible and would not introduce further complications by using only some parts of the weight values during certain processing phases but higher accuracy during other phases.

Re Item VII

Certain defects in the international application

13. Appendix AA contains a complete patent description which is in large parts identical to the description given on pages 1-79. This duplication of information is unnecessary (Rule 9.1(iv)).
14. The statements made on pg. 79 and in Appendix AA, pg. 104 directed to a software emulation of the described circuits render the intended scope of protection unclear as such an embodiment has not been explicitly claimed. (Extending the scope of protection to a software emulation of the claimed circuits requires an appropriate claim).
15. Nearly all references to prior art are incomplete (citing only the name(s) of the author(s) or only the title of the article, cf. e.g. pg. 5 and appendix AA pp. 5-13).
16. The description contains contradictory statements concerning the use of an Euclidean metric and the Manhattan distance. In particular, using the Euclidean metric is envisaged, for example, at pg. 18 of appendix AA while it is strongly discouraged at pg. 26, lines 6-10 and pp. 45-46 of appendix AA. It is apparent from the description as a whole and from present claim 1 that the inventor intends to use only adder/subtractor units (which is only possible using the Manhattan distance and certain alpha values).

All indications that the Euclidean distance might possibly be used instead of the Manhattan distance are causing inconsistencies because:

- (a) it is not at all apparent how the simplicity of a design containing no multipliers ("a feature of the invention", cf. pg. 4) could be maintained if the Euclidean distance was introduced,
- (b) and statements to the effect that this is not possible can already be found in the description, appendix AA, pp. 45-46,
- (c) and the description contains clear statements that in the considered implementation "Euclidean distance is replaced by Manhattan distance", *ibid.*

- 17. At page 20, lines 22-26 erroneous references are made to Figs. 11B, 11C and 3.
- 18. The expression "the controller comprises a handshake mechanism" in claim 7 is unclear as it appears to mix method and system features (the fact that "the controller comprises synchronising means to implement a handshake mechanism" is not clearly expressed). Similar comments apply to claim 16.
- 19. It appears that claim 13 is referencing the wrong claim (14 instead of 12).
- 20. The independent claims are neither cast in the two-part form recommended by Rule 6.3 (b), (i), (ii) PCT (having a pre-characterising portion which correctly reflects the prior art of document D1) nor are - alternatively - the features known from the prior art clearly identified in the description.
- 21. The requirements of Rule 5.1 (a) (ii) PCT are not met as documents D1 and D2 are not acknowledged and discussed in the opening part of the description.

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE
COMMUNICATION OF THE INTERNATIONAL
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

MURGITROYD & COMPANY
373 Scotland Street
Glasgow G2 8DA
ROYAUME-UNI

14 AUG 2000

COMP

Date of mailing (day/month/year) 03 August 2000 (03.08.00)		IMPORTANT NOTICE	
Applicant's or agent's file reference P22866A/VSL/CLF/PPP			
International application No. PCT/GB00/00277	International filing date (day/month/year) 01 February 2000 (01.02.00)	Priority date (day/month/year) 01 February 1999 (01.02.99)	
Applicant AXEON LIMITED et al			

- 1 Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,
GE,GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,
NZ,OA,PL,PT,RO,RU,SD,SE,SG,SJ,SK,SI,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
03 August 2000 (03.08.00) under No. WO 00/45333

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Genève 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Continuation of Form PCT/IB/308

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF
THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

Date of mailing (day/month/year) 03 August 2000 (03.08.00)	IMPORTANT NOTICE
Applicant's or agent's file reference P22866A/VSL/CLF/PPP	International application No. PCT/GB00/00277
<p>The applicant is hereby notified that, at the time of establishment of this Notice, the time limit under Rule 46.1 for making amendments under Article 19 has not yet expired and the International Bureau had received neither such amendments nor a declaration that the applicant does not wish to make amendments.</p>	

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

MURGITROYD

NOTIFICATION OF RECEIPT OF RECORD COPY

06 MAR 2000 PCT Rule 24.2(a))

COMP

To:

MURGITROYD & COMPANY
 373 Scotland Street
 Glasgow G5 8QA
 ROYAUME-UNI

Date of mailing (day/month/year) 25 February 2000 (25.02.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P22866A/VSL/CLF/PPP	International application No. PCT/GB00/00277

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

AXEON LIMITED (for all designated States except US)

LIGHTOWLER, Neil (for US)

International filing date : 01 February 2000 (01.02.00)

Priority date(s) claimed : 01 February 1999 (01.02.99)

Date of receipt of the record copy by the International Bureau : 11 February 2000 (11.02.00)

List of designated Offices :

AP : GH,GM,KE,LS,MW,SD,SL,SZ,TZ,UG,ZW

EA : AM,AZ,BY,KG,KZ,MD,RU,TJ,TM

EP : AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE

OA : BF,BJ,CF,CG,CI,CM,GA,GN,GW,ML,MR,NE,SN,TD,TG

National : AE,AL,AM,AT,AU,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EE,ES,FI,GB,

GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KP,KR,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,

MN,MW,MX,NO,NZ,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,US,UZ,VN,YU,ZA,

ZW

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

☒ time limits for entry into the national phase

☐ confirmation of precautionary designations

☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer: <i>Dorothee Mulhausen</i> Dorothee Mulhausen
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

MURGITROYD & COMPANY
 373 Scotland Street
 Glasgow G5 8PT
 ROYAUME-UNI

03 APR 2000

Date of mailing (day/month/year) 23 March 2000 (23.03.00)	IMPORTANT NOTIFICATION <input checked="" type="checkbox"/> C
Applicant's or agent's file reference P22866A/VSL/CLF/PPP	
International application No. PCT/GB00/00277	International filing date (day/month/year) 01 February 2000 (01.02.00)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 01 February 1999 (01.02.99)
Applicant AXEON LIMITED et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the international Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
01 Febr 1999 (01.02.99)	9902115.6	GB	01 Marc 2000 (01.03.00)

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.36

Form PCT/IB/304 (July 1998)

Authorized officer

Olivia RANAIVOJAONA

Telephone No. (41-22) 338.83.38

003187130

ANNEX TO FORM PCT/IB/301

International application No.

PCT/GB00/00277

INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. It is the applicant's responsibility to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.